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Job No.: CTCE/BBMP/W.No.11/MLN/WMM/Gradation/2016-17 : 22.06.2016

GRADATION FOR WMM
MORTH TABLE-400-11

Customer : **Asst. Executive Engineer,** Vidyaranyapura Sub Division, BBMP, Bangalore.

Agency : **Mr. M. Lakshminarayana,**
#354, 5th A Cross, K.H. Road, Sharadambanagar, Jalahalli, Bangalore - 13.

Name of Work : Improvements to Roads and Drains at Lakkappa Layout in Ward No.11, Vidyaranyapura Sub Division, BBMP, Bangalore.

Reference : AEE/BBMP/VSD/PR/280/2016-17 Dated: 20.06.2016

Date of Testing : 22.06.2016

Material : WMM

Sample Location : WMM Mix Plant Oven Dry Wt (gm): **7815**

Is Sieve Size in mm	Weight Retained (gm)	Cumulative Weight Retained (gm)	Cumulative % of Retained	Cumulative % of Passing	Spec.Limits
53	0	0	0	100	100
45	210	210	2.7	97.3	95-100
22.4	2510	2720	34.8	65.2	60-80
11.2	1210	3930	50.3	49.7	40-60
4.75	1000	4930	63.1	36.9	25-40
2.36	985	5915	75.7	24.3	15-30
0.600	900	6815	87.2	12.8	8-22
0.075	650	7465	95.5	4.5	0-8

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Vidyaranyapura Sub Division
BBMP, Bangalore - 97

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Job No.: CTCE/BBMP/W.No.11/MLN/WMM/Gradation/2016-17 : 22.06.2016

GRADATION FOR WMM
MORTH TABLE-400-11

Customer : **Asst. Executive Engineer,** Vidyaranyapura Sub Division, BBMP, Bangalore.

Agency : **Mr. M. Lakshminarayana,**
#354, 5th A Cross, K.H. Road, Sharadambanagar, Jalahalli, Bangalore - 13.

Name of Work : Improvements to Roads and Drains at Lakkappa Layout in Ward No.11, Vidyaranyapura Sub Division, BBMP, Bangalore.

Reference : AEE/BBMP/VSD/PR/280/2016-17 Dated: 20.06.2016

Date of Testing : 22.06.2016

Material : WMM

Sample Location : WMM Mix Plant Oven Dry Wt (gm): 7235

Is Sieve Size in mm	Weight Retained (gm)	Cumulative Weight Retained (gm)	Cumulative % of Retained	Cumulative % of Passing	Spec.Limits
53	0	0	0	100	100
45	285	285	3.9	96.1	95-100
22.4	2400	2685	37.1	62.9	60-80
11.2	1085	3770	52.1	47.9	40-60
4.75	985	4755	65.7	34.3	25-40
2.36	680	5435	75.1	24.9	15-30
0.600	600	6035	83.4	16.6	8-22
0.075	720	6755	93.4	6.6	0-8

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Vidyaranyapura Sub Division
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Job No.: CTCE/BBMP/W.No.11/MLN/WMM/AIV/2016-17

22.06.2016

Aggregate Impact Value

IS: 2386 Part IV

Customer	**Asst. Executive Engineer,** Vidyaranyapura Sub Division, BBMP, Bangalore.
Agency	**Mr. M. Lakshminarayana,** #354, 5th A Cross, K.H. Road, Sharadambanagar, Jalahalli, Bangalore - 13.
Name of the Work	Improvements to Roads and Drains at Lakkappa Layout in Ward No.11, Vidyaranyapura Sub Division, BBMP, Bangalore.
Reference	AEE/BBMP/VSD/PR/280/2016-17 Dated: 20.06.2016
Source / Location	WMM Plant
Type of Mix	Wet Mix macadam
Date of Testing	22.06.2016

Sl No.	Details	Trial No. 1	Trial No. 2	Average
1	Total weight of aggregate sample filling the cylindrical measure = W_1 g	378	379	
2	Weight of agregate passing 2.36 mm sieve after the test = W_2 g	78	79	
3	Weight of aggregate retained 2.36 mm sieve after the test = W_3 g	300	300	
4	Aggregate Impact value = percent fines	20.63	20.84	
	100* (W_2/W_1)%			20.74

Comments:

→ Maximum allowable Aggregate Impact value for Wet mix Macadam is 30%

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Job No.: CTCE/BBMP/W.No.11/MLN/WMM/AIV/2016-17

22.06.2016

Aggregate Impact Value

IS: 2386 Part IV

Customer	**Asst. Executive Engineer,** Vidyaranyapura Sub Division, BBMP, Bangalore.
Agency	**Mr. M. Lakshminarayana,** #354, 5th A Cross, K.H. Road, Sharadambanagar, Jalahalli, Bangalore - 13.
Name of the Work	Improvements to Roads and Drains at Lakkappa Layout in Ward No.11, Vidyaranyapura Sub Division, BBMP, Bangalore.
Reference	AEE/BBMP/VSD/PR/280/2016-17 Dated: 20.06.2016
Source / Location	WMM Plant
Type of Mix	Wet Mix macadam
Date of Testing	22.06.2016

Sl No.	Details	Trial No. 1	Trial No. 2	Average
1	Total weight of aggregate sample filling the cylindrical measure = W_1 g	389	392	
2	Weight of agregate passing 2.36 mm sieve after the test = W_2 g	88	89	
3	Weight of aggregate retained 2.36 mm sieve after the test = W_3 g	301	303	
4	Aggregate Impact value = percent fines	22.62	22.70	
	100* (W_2/W_1)%			22.66

Comments:

→ Maximum allowable Aggregate Impact value for Wet mix Macadam is 30%

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Job No.: CTCE/BBMP/W.No.11/MLN/WMM/S-T/2016-17 22.06.2016

DETERMINATION OF FLAKINESS INDEX & ELONGATION INDEX OF COARSE AGGREGATES

Customer	**Asst. Executive Engineer,** Vidyaranyapura Sub Division, BBMP, Bangalore.
Agency	**Mr. M. Lakshminarayana,** #354, 5th A Cross, K.H. Road, Sharadambanagar, Jalahalli, Bangalore - 13.
Name of Work	Improvements to Roads and Drains at Lakkappa Layout in Ward No.11, Vidyaranyapura Sub Division, BBMP, Bangalore.
Reference	AEE/BBMP/VSD/PR/280/2016-17 Dated: 20.06.2016
Technical Reference	IS 2386(Part 1) 1963 (RA 2011)
Type of Mix	Wet Mix Macadam
Date of Testing	22.06.2016

Civil-Tech Consultants & Engineers Bangalore

Result : Flakiness Index = **12.35%**

Elongation Index = **13.39%**

Result : Combined Flakiness & Elongation index **25.74%**

Comments:

Maximum allowable Flakiness & Elongation Index for Wet Mix Macadam is 30%

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Job No.: CTCE/BBMP/W.No.11/MLN/WMM/S-T/2016-17 22.06.2016

DETERMINATION OF FLAKINESS INDEX & ELONGATION INDEX OF COARSE AGGREGATES

Customer	**Asst. Executive Engineer,** Vidyaranyapura Sub Division, BBMP, Bangalore.
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Reference	AEE/BBMP/VSD/PR/280/2016-17 Dated: 20.06.2016
Technical Reference	IS 2386(Part 1) 1963 (RA 2011)
Type of Mix	Wet Mix Macadam
Date of Testing	22.06.2016

Civil-Tech Consultants & Engineers Bangalore

Result : Flakiness Index = **11.05.%**

Elongation Index = **13.25%**

Result : Combined Flakiness & Elongation index **13.25%**

Comments:

Maximum allowable Flakiness & Elongation Index for Wet Mix Macadam is 30%

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BBMP, Bangalore - 97

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T-2377

Job No: CTCE/BBMP/W.No.11/MLN/CSR-07/088b/SDBC(QB)/2016-17 11.07.2016

TEST REPORT ON DETERMINATION OF BITUMEN CHARACTERISTICS

*CUSTOMER	:	**Asst. Executive Engineer,** Vidyaranyapura Sub Division, BBMP, Bangalore.
*AGENCY	:	**Mr. M. Lakshminarayana,** #354, 5th A Cross, K.H. Road, Sharadambanagar, Jalahalli, Bangalore - 13.
*NAME OF THE WORK	:	Improvements to Roads and Drains at Lakkappa Layout in Ward No.11, Vidyaranyapura Sub Division, BBMP, Bangalore.
REFERENCE	:	AEE/BBMP/VSD/PR/280/2016-17 Dated: 20.06.2016
*SAMPLE ID	:	Bitumen
DATE OF SAMPLING	:	09.07.2016
PERIOD OF TESTING	:	09.07.2016 to 11.07.2016

The results of the tests conducted on the bitumen sample using for Semi Dense Bituminous Concrete.

Sl. No	Description	Test Method as per IS	Test Result	Requirement as per IS:73:2013
1	Penetration at 25 ^{0}C, 1/10 mm	IS :1203 -1978 (RA-2009)	88	80 to 100
2	Softening point, ^{0}C	IS :1205 -1978 (RA-2009)	44	Min. 40
3	Ductility at 27^{0}C, cm	IS :1208 -1978 (RA-2009)	100 >	Min. 75
4	Flash Point, ^{0}C	IS :1209 -1978 (RA-2009)	302	Min. 220

*Information is furnished by the Customer/Representative.

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Assistant Executive Engineer
Vidyaranyapura Sub Division
BBMP, Bangalore - 97

VISHWANATH .C
Quality Manager

#23/14, 7th Cross, 3rd Stage, 4th Block, Shakthi Ganapathi Nagara, Basaveshwaranagar, Bangalore-79.
Tele Fax : 23223227, Website : www.civiltechconsultants.com
E-mail : vishwanath.ia@civiltechconsultants.com / info@civiltechconsultants.com

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11.07.2016

Aggregate Impact Value

IS: 2386 Part IV

Customer	**Asst. Executive Engineer,** Vidyaranyapura Sub Division, BBMP, Bangalore.
Agency	**Mr. M. Lakshminarayana,** #354, 5th A Cross, K.H. Road, Sharadambanagar, Jalahalli, Bangalore - 13.
Name of the Work	Improvements to Roads and Drains at Lakkappa Layout in Ward No.11, Vidyaranyapura Sub Division, BBMP, Bangalore.
Reference	AEE/BBMP/VSD/PR/280/2016-17 Dated: 20.06.2016
Source / Location	Hot Mix Plant, Bangalore
Type of Mix	Semi Dense Bituminous Concrete
Date of Testing	11.07.2016

Sl No.	Details	Trial No. 1	Trial No. 2	Average
1	Total weight of aggregate sample filling the cylindrical measure = W_1 g	386	388	
2	Weight of agregate passing 2.36 mm sieve after the test = W_2 g	84	85	
3	Weight of aggregate retained 2.36 mm sieve after the test = W_3 g	302	303	
4	Aggregate Impact value = percent fines 100* (W_2/W_1)%	21.76	21.91	21.83

Comments:

→ Maximum allowable Aggregate Impact value for Semi Dense Bituminous Concrete is 27%

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BBMP, Bangalore - 97

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Job No.: CTCE/BBMP/W.No.11/MLN/SDBC/Shape_T/2016-17 11.07.2016

DETERMINATION OF FLAKINESS INDEX & ELONGATION INDEX OF COARSE AGGREGATES

Customer	**Asst. Executive Engineer,** Vidyaranyapura Sub Division, BBMP, Bangalore.
Agency	**Mr. M. Lakshminarayana,** #354, 5th A Cross, K.H. Road, Sharadambanagar, Jalahalli, Bangalore - 13.
Name of Work	Improvements to Roads and Drains at Lakkappa Layout in Ward No.11, Vidyaranyapura Sub Division, BBMP, Bangalore.
Reference	AEE/BBMP/VSD/PR/280/2016-17 Dated: 20.06.2016
Technical Reference	IS 2386(Part 1) 1963 (RA 2007)
Type of Mix	Semi Dense Bituminous Concrete
Date of Testing	11.07.2016

Result : Flakiness Index = **11.39%**

Elongation Index = **13.60%**

Result : Combined Flakiness & Elongation index **24.99%**

Comments:

→ Maximum allowable Flakiness & Elongation Index for Semi Dense Bituminous Concrete is 30%

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Job No.: CTCE/BBMP/W.No.11/MLN/SDBC/Stripping/2016-17

14.07.2016

Stripping Value of Road Aggregates (Static Immersion Test)

IS: 6241

Customer	**Asst. Executive Engineer,** Vidyaranyapura Sub Division, BBMP, Bangalore.
Agency	**Mr. M. Lakshminarayana,** #354, 5th A Cross, K.H. Road, Sharadambanagar, Jalahalli, Bangalore - 13.
Name of the work	Improvements to Roads and Drains at Lakkappa Layout in Ward No.11, Vidyaranyapura Sub Division, BBMP, Bangalore.
Reference	AEE/BBMP/VSD/PR/280/2016-17 Dated: 20.06.2016
Type of Mix	Semi Dense Bituminous Concrete
Date of Testing	14.07.2016

Type of binder : 80/100
Percentage of binder used : 5.0% by wt.
Total weight of aggregate : 200 g
Total weight of binder : 10.0 g
Temperature of water-bath : 40° C

Observation Number	Stripping, Percentage	Average, Percentage	Average Retained Coating, %
1	3.3	3.40	96.60
2	3.4		
3	3.5		

Comments:

→ Minimum allowable Aggregate retained coating for Semi Dense Bituminous Concrete is 95%

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Job No.: CTCE/BBMP/W.No.11/MLN/SDBC/Sp_Wa/2016-17 14.07.2016

Specific Gravity And Water Absorption Test

IS: 2386 Part III

Customer	**Asst. Executive Engineer,** Vidyaranyapura Sub Division, BBMP, Bangalore.
Agency	**Mr. M. Lakshminarayana,** #354, 5th A Cross, K.H. Road, Sharadambanagar, Jalahalli, Bangalore - 13.
Name of the Work	Improvements to Roads and Drains at Lakkappa Layout in Ward No.11, Vidyaranyapura Sub Division, BBMP, Bangalore.
Reference	AEE/BBMP/VSD/PR/280/2016-17 Dated: 20.06.2016
Type of Mix	Semi Dense Bituminous Concrete
Source / Location	Hotmix Plant, Bangalore
Date of Testing	14.07.2016

Sl. No.	Details	Notation	Test Number			Mean Value
			Test 1	Test 2	Test 3	
1	Weight of aggregate suspended in water with the basket	W_1 g	2020	2021	2022	
2	Weight of basket suspended in water	W_2 g	750	750	750	
3	Weight of saturated aggregate in water	$(W_1 - W_2) = W_s$ g	1270	1271	1272	
4	Weight of saturated surface dry aggregate in air	W_3 g	2019	2025	2024	
5	Weight of water equal to the volume of the aggregate	$(W_3 - W_S)$ g	749	754	752	
6	Weight of oven dried aggregate	W_4 g	2010	2015	2005	
7	Specific Gravity	$W_4/(W_3-W_S)$	2.684	2.672	2.666	2.674
8	Apparent Specific gravity	$W_4/(W_4-W_S)$	2.716	2.708	2.735	2.720
9	Water Absorption	$((W_3-W_4)*100)/W_4$	0.45%	0.50%	0.95%	0.63%

Comments:

→ Maximum allowable Aggregate Water absorption value for Semi Dense Bituminous Concrete is 2.0%

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Job No.: CTCE/BBMP/W.No.11/MLN/SDBC/Bitumen/2016-17

14.07.2016

BITUMEN DETERMINATION OF SEMI DENSE BITUMINOUS CONCRETE MIX

AS per IRC : SP : 11 - 1984

CUSTOMER	**Asst. Executive Engineer,** Vidyaranyapura Sub Division, BBMP, Bangalore.
AGENCY	**Mr. M. Lakshminarayana,** #354, 5th A Cross, K.H. Road, Sharadambanagar, Jalahalli, Bangalore - 13.
NAME OF THE WORK	Improvements to Roads and Drains at Lakkappa Layout in Ward No.11, Vidyaranyapura Sub Division, BBMP, Bangalore.
REFERENCE	AEE/BBMP/VSD/PR/280/2016-17 Dated: 20.06.2016
SAMPLE I/D	Lakkappa Layout in Ward No.11, BBMP, Bangalore.
DATE OF TESTING	14.07.2016

BITUMEN CONTENT DETERMINATION

Description	Trail 1	Trail 2
1. Weight of Mixture before Test, g	500	500
2. Weight of Mixture after Test, g	474.5	474.5
3. Weight of Asphalt and Mineral matter Extracted, g	-	-
4. Weight of Mineral Matter, g.	-	-
5. Weight of Ash, g		
6. Weight of Bitumen Extracted, g. (corrected)	25.5	25.50
7. Bitumen content in %	5.10	5.10
8. Average	**5.10**	

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Vidyaranyapura Sub Division
BBMP, Bangalore - 97

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Job No.: CTCE/BBMP/W.No.11/MLN/SDBC/Bitumen/2016-17 14.07.2016

GRADATION DETERMINATION OF SEMI DENSE BITUMINOUS CONCRETE MIX

As per IS : 2386 and IRC : SP : 11 - 1984

CUSTOMER	**Asst. Executive Engineer,** Vidyaranyapura Sub Division, BBMP, Bangalore.
AGENCY	**Mr. M. Lakshminarayana,** #354, 5th A Cross, K.H. Road, Sharadambanagar, Jalahalli, Bangalore - 13.
NAME OF THE WORK	Improvements to Roads and Drains at Lakkappa Layout in Ward No.11, Vidyaranyapura Sub Division, BBMP, Bangalore.
REFERENCE	AEE/BBMP/VSD/PR/280/2016-17 Dated: 20.06.2016
SAMPLE I/D	Lakkappa Layout in Ward No.11, BBMP, Bangalore.
DATE OF TESTING	14.07.2016

GRADATION AFTER EXTRACTION

Sieve Size in mm	Trail 1				Specified Limits as per MORTH specification table 500-15 (Grading-2)
	Weight Retained, gm	% Retained	%Cummulative Retained	% Passing	
13.2	0	0	0	100	100
9.5	23.36	4.92	4.92	95.08	90-100
4.75	256.3	54.01	58.94	41.06	35-51
2.36	58.35	12.30	71.23	28.77	24-39
1.18	50.21	10.58	81.82	18.18	15-30
0.3	30.22	6.37	88.19	11.81	9-19
0.075	32.32	6.81	95.00	5.00	3-8

Sieve Size in mm	Trail 2				Specified Limits as per MORTH specification table 500-15 (Grading-2)
	Weight Retained, gm	% Retained	%Cummulative Retained	% Passing	
13.2	0	0	0	100	100
9.5	29.65	6.25	6.25	93.75	90-100
4.75	265.3	55.91	62.16	37.84	35-51
2.36	52.25	11.01	73.17	26.83	24-39
1.18	40.21	8.47	81.65	18.35	15-30
0.3	26.36	5.56	87.20	12.80	9-19
0.075	29.33	6.18	93.38	6.62	3-8

Assistant Executive Engineer
Vidyaranyapura Sub Division
BBMP, Bangalore - 97

Note:

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Þ The results indicated above are based on the tests carried out on the samples received in the laboratory

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M/s. Civil-Tech Consultants & Engineers

#23/14, 7th Cross, 3rd Stage, 4th Block, Shakthi Nagara, Basaveshwaranagar, Bangalore-79

Tele Fax : 23223227, Website : www.civiltechconsultants.com

E-mail : vishwanath.ia@civiltechconsultants.com / info@civiltechconsultants.com

CIVIL-TECH CONSULTANTS AND ENGINEERS

Building & Highway Material Testing Laboratory

An ISO 9001:2008 Certified Company

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Job No.: CTCE/BBMP/W.No.11/MLN/SDBC/AGG/2016-17 14.07.2016

Aggregate Gradation Test

IS : 2386 Part I

Customer	**Asst. Executive Engineer,** Vidyaranyapura Sub Division, BBMP, Bangalore.
Agency	**Mr. M. Lakshminarayana,** #354, 5th A Cross, K.H. Road, Sharadambanagar, Jalahalli, Bangalore - 13.
Name of the Work	Improvements to Roads and Drains at Lakkappa Layout in Ward No.11, Vidyaranyapura Sub Division, BBMP, Bangalore.
Reference	AEE/BBMP/VSD/PR/280/2016-17 Dated: 20.06.2016
Sample I / D	Hot Mix Plant, Bangalore
Type of Mix	Semi Dense Bituminous Concrete (SDBC)
Date of Testing	14.07.2016

Total Weight of Sample: **5300** gm

SIEVE SIZE, mm	Weight Retained, gm	% Retained	Cummulative % Retained	% Passing	Grade-II As per MORTH	Remarks
13.2	0	0.0	0	100	100	Gradation satisfies Grade-II MORTH specification
9.5	400	7.5	7.55	92.45	90-100	
4.75	2650	50.0	57.55	42.45	35-51	
2.36	685	12.9	70.47	29.53	24-39	
1.18	490	9.2	79.72	20.28	15-30	
0.3	390	7.4	87.08	12.92	9-19	
0.075	345	6.5	93.58	6.42	3-8	

Total Weight of Sample: **5350** gm

SIEVE SIZE, mm	Weight Retained, gm	% Retained	Cummulative % Retained	% Passing	Grade-II As per MORTH	Remarks
13.2	0	0.0	0	100	100	Gradation satisfies Grade-II MORTH specification
9.5	350	6.5	6.54	93.46	90-100	
4.75	2900	54.2	60.75	39.25	35-51	
2.36	635	11.9	72.62	27.38	24-39	
1.18	455	8.5	81.12	18.88	15-30	
0.3	320	6.0	87.10	12.90	9-19	
0.075	380	7.1	94.21	5.79	3-8	

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Assistant Executive Engineer
Vidyaranyapura Sub Division
BBMP, Bangalore-97

M/s. Civil-Tech Consultants & Engineers
23/14, 7th Cross, 3rd Stage,
4th Block, Shakthiganapathinagara,
Basaveshwaranagar,
Bangalore-560079.